ICSET THERMAL ANALYSIS LABORATORY

THERMAL ANALYSIS LABORATORY'S SECOND ANNUAL HANDS-ON SHORT COURSE

The Thermal Analysis Lab hosted its annual hands-on short course on April 6-8, 2010. The course was attended by twenty individuals from various industries in surrounding states. Topics covered included TGA, DSC, high-pressure TGA, and evolved gas analysis. The course was well-received with many of the participants stating that they would definitely recommend the course to their colleagues. One of the advantages to our course over lecture-only courses is the ability of the participants to run their own samples and get interactive feedback from our knowledgeable instructors about strange results and ways to determine what is truly happening. We are already looking forward to our next course in 2011. If interested, feel free to contact us.

HIGH-PRESSURE TGA

The lab acquired the high-pressure TGA that was mentioned in the previous flyer in September of 2009 (Figure 1). Since then, we have been using this new instrumentation to study the pyrolysis and gasification of biomass and coal. Variables examined have included the total pressure, initial moisture, and flow rate of the purge gas. Figure 2 shows the results for the effect of pressure on the pyrolysis of biomass. With increasing pressure, the temperature of the initial DTG peak is shifted to higher temperatures, while that of the second DTG peak is shifted to lower temperature indicating that the initial volatilization is retarded while the pyrolysis reaction at elevated temperature is accelerated.

Figure 1

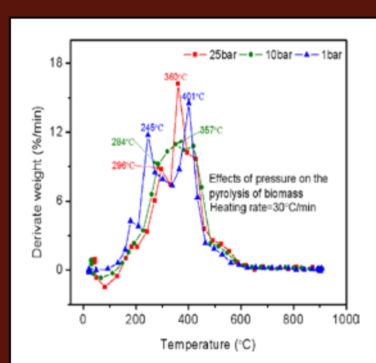

Figure 2

CAPABILITIES

- Formulation and Optimization
- Materials Selection
- Application Development
- End-use Performance Prediction
- Competitive Product Evaluation
- Vendor Certification
- Incoming/Outgoing Materials Consistency
- Process Optimization
- Finished Product Performance
- Troubleshooting

TA Laboratory Coordinator:

Quentin Lineberry, Ph.D.

2413 Nashville Road – C2

Bowling Green, KY 42101

270-780-2532 (Direct)

270-745-2221 (Fax)

thermal@wku.edu

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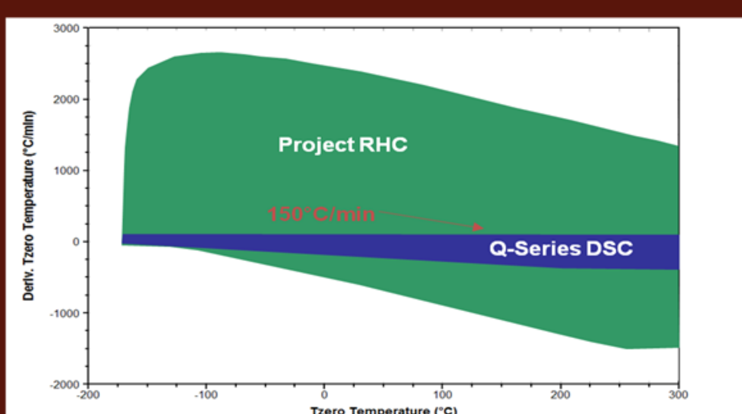
THERMAL ANALYSIS LABORATORY PUBLICATION RECORD

The Thermal Analysis Lab has achieved an impressive record of publication over the years. Below is a list of our most cited articles:

1. Xie, W.; Gao, Z.; Pan, W. P.; Hunter, D.; Singh, A; Vaia, R. Thermal Degradation Chemistry of Alkyl Quaternary Ammonium Montmorillonite. *Chem. Mater.* **2001**, *13*, 2979-90. **(345 Citings)**
2. Xie, W.; Xie, R.; Pan, W. P.; Hunter, D.; Koene, B.; Tan, L. S.; Vaia, R. Thermal Stability of Quaternary Phosphonium Modified Montmorillonite. *Chem. Mater.* **2002,** *14,* 4837-45. **(106 Citings)**
3. Xie, W.; Pan, W. P.; Chuang, K. C. Thermal Characterization of PMR Polyimides. *Thermochim. Acta*, **2001**, *367-368,* 143-153. **(96 Citings)**
4. Xu, W.; Liang, G.; Zhai, H.; Tang, S.; Hand, G.; Pan, W. P. Preparation and Crystallization Behavior of PP/PP-g-MAH/Org-MMT Nanocomposite. *Eur. Polym. J.* **2003,** *39,* 1467-1474. **(48 Citings)**
5. Hwu, J. M.; Hiang, G. J.; Gao, Z. M.; Xie, W.; Pan, W. P. The Characterization of Organic Modified Clay and Clay-Filled PMMA Nanocomposite. *J. of Appl. Polym. Sci.* **2002,** *83,* 1702-1710. **(44 Citings)**
6. Xie, W.; Hwu, J. M.; Jiang, G. J.; Buthelezi, T. M.; Pan, W. P. A Study of the Effect of Surfactants on the Properties of Polystyrene-Montmorillonite Nanocomposites. *Polym. Eng. Sci.* **2003,** *43(1),* 214-222. **(36 Citings)**
7. Xu, W.; Liang, G.; Wang, W.; Tang, S.; He, P.; Pan, W. P. PP-PP-g-MAH-Org-MMT Nanocomposites. 1. Intercalation Behavior and Microstructure. *J.Appl. Polym. Sci.* **2003**, *88*(14), 3225-3231. **(34 Citings)**
8. Xie, W.; Pan, W. P. Thermal Characterization of Materials Using Evolved Gas Analysis. *J. Therm. Anal. Calorim.* **2001**, *65*(3), 669-685. **(29 Citings)**

UPCOMING INSTRUMENTATION

The lab is currently in the process of acquiring a rapid heating/cooling DSC. This instrument's experimental limits are far outside the range of typical DSCs, which will allow for improved sensitivity, suppression of kinetic events, and better simulation of production processes. This system achieves high heating rates using an IR furnace and rapid cooling using a large liquid nitrogen-filled heat sink. The figure below shows the heating/cooling rate envelope of the RHC DSC compared to a standard DSC.



INSTRUMENTATION

- **High-Resolution/Modulated Thermogravimetric Analyzers**
- **High-Pressure Thermogravimetric Analyzer**
- **Modulated and Pressurized Differential Scanning Calorimeters**
- **Evolved Gas Analysis Systems (TG-FTIR and TG-MS)**
- **Dynamic Mechanical Analyzer**
- **Thermomechanical Analyzer**
- **Dielectric Analyzer**
- **Micro-thermal Analyzer**
- **Pyroprobe-GC/MS System (with reactive gas option)**
- **SEM-EDX and Optical Microscope/Image Analysis System**
- **X-ray Diffractometer (with in-situ heating)**